take place. This point is emphasized by Weismann as against Kölliker; but we conceive the principal point at issue between the two thinkers lies in their conception of the relation of cell division to differentiation. To Weismann ontogeny is an analysis, due to inherent mechanical arrangements in the protoplasm. To Kölliker, ontogenetic differentiation, like phylogenetic differentiation, is dependent on external conditions. Kölliker does not push his theory to logical conclusions. He might say: If one of the conjugating pronuclei could be replaced by a nucleus from a brain cell or a liver cell for example, there would be no radical dislocation in the embryonic development. This position appears scientifically defensible; and we could add a second scholium, viz.: That in this experiment any fragment of a nucleus taken without definite shape or size, would do just as well, because the nucleus appears to be an aggregate of a vast number of similar gemmules. But the most important question of heredity, viz., How are the new characters acquired by the germ plasm? is still unanswered. Weismann emphatically disbelieves that acquired characters can be transmitted, or that the germ cell receives anything except food from the body. He is forced to the conclusion, that the germ plasm must vary indefinitely, and that adaptation is due to natural selection simply. It seems to be rash to deny that the body has a definite action on the germ cells. The researches of Gaule and his pupils tend to show that something more vital than food wanders from cell to cell. In this line we have to await further developments. Gaule believes that gemmules make the circuit of the tissues to finally lodge in the reproductive organs. The following author dwells on this aspect of the problem.

Ueber Vererbung. NUSSBAUM. Bonn, 1888.

Nussbaum seems to mediate between the positions of Weismann and Kölliker. He admits that like can produce only like, but germinal matter is probably more widely spread than Weismann believes. In the protozoa, Weismann has admitted that the environment causes characters to be acquired that are transmitted, because here is asexual reproduction by division. But we have seen that the nucleus governs the formation of structures in *stentor*, etc., hence the environment must first affect the nucleus, and we naturally conclude that as the germ cell has the power to produce a soma for its own nutrition, that the same soma is an instrument of mediation between the environment and the germ cell. The fact that the character of the father of the first offspring affects the subsequent offspring of the same mother, but by a different father, (ignored by many theories of heredity) shows that sexual cells are capable of marked and definite modification. In this connection we may mention Sequard's experiments upon rabbits. By artificially produced lesions of the cord, epilepsy was caused; and the offspring of such epileptic rabbits suffered from congenital epilepsy.

Ueber die Vererbung. WEISMANN. Jena, 1883.

By Weismann we are reminded that no disease is inherited, but only the tendency to diseases; this is only a particular statement of a more universal law, that our characters are the particular modes of reaction the body has taken with reference to particular circumstances, and thus the particular form of our features only partially represents our hereditary or idioplasmic characteristics. Epilepsy is not a good disease to experiment with, because it may be caused by a certain weakness of nervous organization due to general malnutrition of the embryo caused by epilepsy (or the nervous disturbance of which epilepsy was the symptom) in the mother. The experiment should be repeated, on the males only, to be valid. Weismann does not hesitate to declare that

there is not known a single authentic case of the inheritance of acquired characters. The pamphlet contains in general the ideas noted above.

Die Thatsachen der Vererbung. ROTH. Berlin, 1885.

We have no opportunity to review the older theories of heredity, and simply refer those desiring abstracts of the more important to the above. The author intersperses critical notices of his own.

Ueber die Dauer des Lebens. WEISMANN. Jena, 1882.

A curious but interesting discussion has arisen between Weismann and Götte concerning the relation of reproductive and somatic cells to the length of life and the causes of death. The former calls attention to the fact that protozoa are essentially immortal. We have a continuous growth of protoplasm, and the multiplication of individuals is due to continuous self-division. Of course myriads of individuals are continuously destroyed, but this is not due to any inner principle of senescence, but to other accidents. In metazoa, however, we have, besides "catastrophic death," a "natural death," which is not original, but has been acquired for the good of the species. Natural selection has fixed the length of life for each species at just those limits that admit of the fullest amount of reproductive activity needed to maintain the species. Slow breeders are longest lived; this law is correlated with a second law that the fecundity of the species or the number of eggs or young produced is dependent in direct ratio upon the liability to their destruction before maturity is attained. Protozoa became metazoa by the products of division remaining in contact to form a colony or mass of cells, among which differentiation of labor was instituted and a certain proportion of the cells were modified to serve the reproductive cells. It was clearly of no use for any but reproductive cells to remain immortal, and hence the power to divide so as to pass less and less germinal plasma into the somatic cells was advantageous and was preserved by natural selection. Weismann also thinks that the somatic cells were impressed with power of limited production, those in long lived individuals having the power to produce a greater number of generations than in the short lived. This appears as a weak point in the theory, for it would be difficult to prove that what is called natural death is not in all cases due to inner catastrophic causes, usually the failure in proper functioning of some vital organ. The fact that tissues can indefinitely regenerate themselves shows that their cells, if they receive proper conditions of nutrition, are practically immortal.

Ueber den Ursprung des Todes. GÖTTE. Leipzig, 1883.

Weismann's paper called forth this by Götte. His thesis is, that death is in all cases fundamental, that protozoa even have to die. The organization of the protoplasm breaks up and is reconstituted in the process known as *rejuvenescence*, in which the unicellular being, after having secreted a case or cyst about itself, lies dormant for a time as if in sleep. In the formation of a colony the cells may be alike *(homoplastic)* or unlike *(heteroplastic)*. The metazoa all belong to the latter group. In the first group reproduction of the body-colony is accompanied by the dissolution of the units, each of which continues its life, and by self-division produces a new colony-individual. But the parent individual has ceased to exist. Is this to be termed death? If so, where is the corpse? The dissolution is to be considered as dependent on the fact that each of the cells undergoes *rejuvenescence*, that they may recontinue to divide, and in so doing produce the new individuals. Among the heteroplasts only the reproductive cells have the chance to form new individuals, but the colony, as in the lowest metazoa, (mezozoa=*orthonectida*, etc.,) breaks up during reproduction, and the few somatic cells